



6712-01

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 2 and 15

[ET Docket No. 07-113; RM-11104; FCC 13-112]

Operation in the 57-64 GHz Band

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: This document modifies the Commission's rules for intentional radiators operating on an unlicensed basis in the 57-64 GHz frequency range (60 GHz). The rules were modified to allow higher emission limits for 60 GHz devices that operate outdoors with very high gain antennas to encourage broader deployment of point-to-point broadband systems; to specify the emission limit for all 60 GHz devices as an EIRP power level to promote repeatability of measurement data and provide uniformity and consistency in the rules; and to eliminate the requirement for certain 60 GHz devices to transmit identification information (transmitter ID). The amended rules will allow longer communication distances for unlicensed 60 GHz point-to-point systems that operate outdoors and thereby extend the ability of such systems to provide broadband service, particularly to office buildings and other commercial facilities. The Commission believes that the enhanced 60 GHz systems that will be allowed by these rule changes will help the Commission fulfill its objectives to bring broadband access to every American by providing additional competition in the broadband market, lowering costs for small business owners accessing broadband services, and supporting the deployment of 4th generation (4G) and other wireless services in densely populated areas.

DATES: Effective [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

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SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Report and Order, ET Docket No. 07-113, FCC 13-112, adopted August 9, 2013 and released August 9, 2013. The full text of this document is available for inspection and copying during normal business hours in the FCC Reference Center (Room CY-A257), 445 12th Street, SW., Washington, DC 20554. The complete text of this document also may be purchased from the Commission's copy contractor, Best Copy and Printing, Inc., 445 12th Street, SW., Room, CY-B402, Washington, DC 20554. The full text may also be downloaded at: www.fcc.gov. People with Disabilities: To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (tty).

Summary of Report and Order

1. The Commission adopted the Notice of Proposed Rulemaking (NPRM), 72 FR 39588, July 19, 2007, in this proceeding in response to a petition for rule making from the Wireless Communications Association (WCA). To encourage broader deployment of point-to-point digital systems in the 60 GHz band without increasing the potential for harmful interference, the Commission proposed to specify the emission limit for 60 GHz devices as EIRP instead of as power density units, and to increase the emission limit from

40 dBm to 82 dBm for devices using an antenna with gain greater than 51 dBi. The Commission also proposed to increase the peak power and average power EIRP limits relative to a specific antenna gain for devices located outdoors or those located indoors with emissions directed outdoors, e.g., through a window, and to eliminate the transmitter identification requirement for devices located indoors. The Commission did not propose to make any change to the spurious emission limit but proposed to also express this limit alternatively as EIRP to be consistent with the measurement unit proposed for main-beam fundamental emissions.

2. In the Report and Order, the Commission modified its rules to allow operation at higher power levels by 60 GHz unlicensed devices that use an antenna exceeding a specific gain and operate outdoors. Specifically, for 60 GHz devices located outdoors, we increase the average equivalent isotropically radiated power (EIRP) limit from 40 dBm to 82 dBm minus 2 dB for every dB that the antenna gain is below 51 dBi, and peak EIRP emission limit from 43 dBm to 85 dBm minus 2 dB for every dB that the antenna gain is below 51 dBi. Also, the amended rules will specify the emission limits for all 60 GHz devices in terms of equivalent isotropically radiated power (EIRP). These rule changes will provide needed flexibility to improve performance and provide cost savings for unlicensed devices to support broadband service in the 60 GHz band. These revisions also have the potential to foster the development of products with longer operating distances than are achievable under the current rules and to promote use of the 60 GHz band as a vehicle for broadband transmission links. This will encourage the development of very high speed wireless links for use in locations where highways, parking lots, or other obstructions may prevent the extension of fiber or wireline

connections, to connect multiple buildings in a campus environment, or to provide backhaul connections for new 4G wireless services.

3. The Commission also amended its rules to specify the antenna requirements for compliance testing of 60 GHz devices that will operate at higher power with very high gain antennas and to eliminate the transmitter identification (transmitter ID) requirement.

Power Limits

4. The Commission modified its rules to specify the emission limits for 60 GHz devices in terms of EIRP. No party objected or provided any substantive comments to our proposals. The Commission observes that the WCA petitioned for this change because the existing rules specify the emission limit at a measurement distance of 3 meters, a distance that would be in the near field of a high gain 60 GHz antenna, and measurements in this region of the antenna are difficult to make due to the high variability of the RF field. Consequently, when this measurement distance is in the near field of a 60 GHz antenna, the test results can vary substantially with varying distances from the transmitter, making it very difficult to demonstrate compliance of the equipment under test with the emission limit due to lack of repeatability of the test results. The Commission finds that specifying the emission limits for 60 GHz devices as EIRP, which can be easily calculated, will simplify the process for demonstrating compliance with the rules. It further notes that in other sections of the part 15 rules, e.g., the spread spectrum rules in §15.247 and the Unlicensed National Information Infrastructure (UNII) rules in §15.407, the emission limit for those devices is specified in terms of EIRP. Although in the NPRM the Commission proposed to maintain the existing power density limits for

devices other than very high gain systems as an alternative to the EIRP limits as long as the 3-meter measurement distance is in the antenna far field, it finds that specifying the emission limit for all 60 GHz devices as EIRP will provide uniformity and consistency in the rules for all 60 GHz devices, simplify the measurement procedure, and improve the repeatability of test results. Measurement procedures that have been found to be acceptable to the Commission in accordance with § 2.947 of our rules may be used to demonstrate compliance.

5. The Commission amended § 15.255(b)(1) of the rules to specify emission limits for all unlicensed 60 GHz devices in terms of EIRP. Because 60 GHz devices are already required to be tested for compliance, this rule change does not increase the burden on compliance testing for manufacturers and could facilitate the measurement of emission levels for both point-to-point and networking 60 GHz devices while greatly improving measurement accuracy.

6. Although the record provides some support for the proposals made in the NPRM to increase the average and peak emission limits for transmitters with very high gain antennas, some commenters have expressed concern over the potential for window links using higher power levels indoors to interfere with the operation and deployment of WPAN and other consumer devices. The Commission thus is modifying the rules to allow increased power for 60 GHz transmitters using very high gain antennas located outdoors, but it will not apply these higher limits to any antenna located indoors, including window links.

Indoor Devices, including Window Links

7. The Commission will continue to require that all 60 GHz devices using indoor antennas, including those with emissions directed outdoors as window links, comply with

the existing lower emission limits. It notes that our rules already permit the use of 60 GHz point-to-point transmitters with a relatively low-gain antenna (i.e., up to 30 dBi at the 10W (40 dBm) maximum EIRP, with a transmitter output power of 10 dBm) as window links, and they are now co-located with wireless personal area networking (WPAN) devices without causing harmful interference. In most cases, both types of devices are under the control of the same party who could take steps to eliminate interference, e.g., by moving one or both devices a short distance away from one another. However, the Commission agrees with Motorola that in public locations such as shopping malls or airports, where a 60 GHz point-to-point device and a WPAN network may not be under the same ownership or otherwise control, the use of higher-power EIRP for window links may present concerns and difficulties in resolving potential interference among different equipment operators. The Commission further observes that BridgeWave, a manufacturer of point-to-point 60 GHz devices, has submitted that window links are very rare because office building occupants rarely tolerate indoor mounting of a radio behind a window. The Commission thus concludes that window links may not generally be needed (or used) to link one building to another, but if they are used, they must continue to comply with the lower emission limit permitted under the current rules. Alternatively, operators can link one building to another by using higher power point-to-point outdoor installations (e.g., from rooftop to rooftop). In addition, the Commission does not expect that higher power 60 GHz transmitters using very high gain antennas would be a common candidate for residential installation destined to replace digital subscriber line (DSL) and cable modem broadband services, because the high cost of the point-to-point devices would preclude their off-the-shelf retail marketing to

consumers. Therefore, out of abundance of caution and in view of the limited use of window links as reflected in the record, the Commission will not permit window links to operate at the higher EIRP levels.

Outdoor Devices

8. Consistent with our proposals in the NPRM, the Commission modified the rules to adopt an average EIRP limit of 82 dBm and a peak EIRP limit of 85 dBm, in each case minus 2 dB for every dB that the antenna gain is below 51 dBi, for 60 GHz devices using very high gain antennas that are located outdoors. It finds that this increase in emission limits for antennas located outdoors will facilitate the use of longer range 60 GHz devices in wireless applications without causing harmful interference to authorized radio services in this band or disrupting the operations of other unlicensed devices, including indoor WPAN systems that currently use this band. The Commission believes that this change in the rules will enhance the value of the 60 GHz band as a vehicle for delivering broadband, particularly the high-capacity backhaul required for 4G wireless services. This approach will afford 4G and other broadband providers greater operational flexibility at lower cost by allowing them to use unlicensed devices for backhaul, reserving licensed spectrum for other uses, thereby promoting spectrum efficiency. Because existing outdoor point-to-point 60 GHz devices are restricted to much lower emission limits, these changes to our rules would provide tangible benefits, including to small businesses and consumers, without additional regulatory costs.

9. In the NPRM, the Commission tentatively concluded that several factors will offset any increase in the interference potential between equipment with very high gain antennas and other devices in the 60 GHz band. The Commission noted that: 1) the very high gain antennas used would be highly directional, reducing the probability that a low

power, omnidirectional system would be located within its beamwidth; 2) low power devices will operate primarily indoors because of their shorter range, whereas very high gain directional systems will primarily be located outdoors because of their longer transmission range, thus the emissions from directional systems, as seen by lower power indoor devices, will be attenuated significantly from intervening objects, such as building walls; and 3) oxygen and water vapor absorption and scattering should further reduce ranges at which the radiated emissions from 60 GHz equipment with very high-gain antennas could cause interference.

10. The Commission is not persuaded by the opposing commenters from the indoor networking industry that our preliminary view is incorrect. The Commission finds that the high propagation losses in the 60 GHz band combined with the pencil beam of the high-gain antennas substantially mitigate the interference potential of these devices. These devices must be very accurately pointed to a very precise location in order to operate effectively. As the antenna gain increases, the beamwidth of the antenna becomes narrower, making it less likely that these devices will cause interference to nearby receivers unless they are located directly in the path of this pencil-thin antenna beam. In this regard, the Commission observes that in order to keep a link with a high gain antenna operating, the transmitter and receiver must be aligned using a special alignment tool, so that the likelihood of inadvertent transmission through such a window is remote. Because of the highly directional nature of 60 GHz point-to-point communications, if the link were misaligned and the transmitter's signals would be mistakenly directed toward a receiver other than its intended receiver, the communication

link itself would be broken (transmission terminated) and realignment would be required to reestablish the link.

11. Additional factors further discount the likelihood of harmful interference, as suggested by the Institute of Electrical and Electronics Engineers (IEEE) 802.18 Radio Technical Advisory Group (IEEE RR-TAG), from an outdoor high-power remotely-mounted transmitter (e.g., mounted on the roof of an adjacent building, on a balcony, or under a roof overhang) that may inadvertently transmit radiation into the window of a room where a WPAN receiver may be operating. One is the geographic separation between higher power point-to-point outdoor installations and low-power indoor WPAN networks. This factor is significant because of the very short range associated with 60 GHz devices (touted as a benefit by manufacturers of both outdoor and indoor consumer products in light of its security advantages). IEEE RR-TAG also fails to address the effects of attenuation. Even if a small portion of the emission from a high gain outdoor antenna were to enter into a room through a window, that low-level emission would first be attenuated by the glass, before being further attenuated by other objects in the room, thus minimizing its potential interference effect significantly. For all these reasons, and absent any record evidence to the contrary, it is our predictive judgment that the proposed change as limited to outdoor devices would not result in harmful interference, which is defined not to protect against isolated occurrences, but only against interference that “seriously degrades, obstructs, or repeatedly interrupts” a radio communication service.

12. The Commission also decline to adopt the IEEE RR-TAG’s recommendations for measuring nearby buildings’ perimeter power density and for

adopting an automatic transmit power control to limit the maximum power at the receiver end of a point-to-point link. The Commission finds such requirements unnecessary for co-existence between indoor and outdoor unlicensed devices in this band because of the high signal propagation losses at these frequencies and the highly narrow beamwidth of the outdoor devices; furthermore, the IEEE RR-TAG did not support its recommendations with any specific interference data. In response to IEEE RR-TAG comments, Motorola recommends that, absent more specific data and justification, the Commission simply limit use to the minimum power necessary to complete the link in accordance with good engineering principles and require that all point-to-point devices have the ability to adjust power output downward. The Commission agrees with Motorola that it should not require the IEEE-recommended limitations without more data and justification. However, the Commission finds that the power at an individual location can be adjusted by antenna selection therefore, it is not necessary to require that the ability to adjust power output be built into the transmitter, which would add cost without countervailing benefit. The Commission also notes that both the 60 GHz outdoor and indoor equipment are unlicensed devices that do not have priority rights to the spectrum over one another; however, the geographical separation of the two types of equipment will eliminate any potential of harmful interference.

13. Finally, the Commission observes that since the adoption of the NPRM, there has been ample time for Space Frequency Coordination Group (SFCG) to conduct its studies regarding the Earth Exploration Satellite Service (EESS). Further, the Commission does not maintain the specific data on 60 GHz devices as requested by SFCG, other than the information submitted in the device certification applications,

which can be accessed through our public equipment authorization database. In addition, the Commission agrees with Motorola that the potential for interference to EESS is sufficiently low such that the need for additional study does not warrant a delay in our decision. The Commission finds that the high-gain antennas with very narrow beam widths employed by 60 GHz devices operating under the new higher EIRP limits, combined with the atmospheric attenuation and severe propagation losses at these frequencies will limit any potential for interference to EESS and that sharing of this service with 60 GHz devices at higher EIRP limits will not be a cause for concern.

Antenna Substitution

14. Section 15.204(c)(4) of the rules allows intentional radiators to be marketed and used with any antenna that is of the same type and of equal or less directional gain as the antenna authorized with the equipment. Manufacturers must provide a list of acceptable antenna types with an application for equipment authorization, and the Commission does not require retesting of a system configuration that uses an antenna that is the same type and with equal or less directional gain than the one it authorizes.

15. The Commission concludes that 60 GHz devices that will operate outdoors under the higher EIRP limits it is adopting herein should be authorized for operation using only the specific antenna(s) with which the system will be marketed and operated. In particular, as proposed in the NPRM, the Commission will require that compliance testing be performed using the highest gain and the lowest gain antennas for which certification is being sought, rather than testing only the highest gain antenna for each antenna type as permitted by § 15.204(c). The Commission finds that testing of both highest and lowest gain antennas is necessary given that our rules will allow the EIRP to

vary relative to the antenna gain, thus ensuring compliance with our emission and RF exposure limits. It will continue to require, as also proposed in the NPRM, that compliance testing be performed with the 60 GHz intentional radiator operated at its maximum available output power level and that the applicant for equipment certification provides a list of acceptable antennas with its application. Accordingly, the Commission is amending §15.255(b)(1)(ii) to specify the above antenna requirements for the higher power 60 GHz transmitters. Because 60 GHz devices are already required to be tested for compliance with all the types of antennas that are intended to be used with the equipment and to submit the worst-case results in the application for certification, the additional regulatory cost of providing information on an additional test result already required to be performed by our rules is not significant.

Spurious Emissions

16. Spurious emissions are those emissions on a frequency outside the necessary bandwidth, the level of which may be reduced without affecting the transmission of information. Section 15.255(c)(3) requires that 60 GHz equipment spurious emissions between 40 GHz and 200 GHz be limited to 90 pW/cm² at a distance of 3 meters, which is equivalent to an EIRP level of -10 dBm. In the NPRM, the Commission proposed to retain the existing limits on spurious emissions but clarified in the proposed rule §15.255(c)(3) that measurements must be made in the far field and that if the far field distance is greater than 3 meters, then the measurement results would need to be extrapolated to a distance of 3 meters according to § 15.31(f)(1).

17. The Commission declined to adopt the clarification proposed in the NPRM with regard to the measurement distance with respect to spurious emissions. In the

NPRM, the Commission proposed to express this limit alternatively as EIRP to be consistent with the measurement unit proposed for main-beam fundamental emissions. BridgeWave's comments clearly indicate a presumption that the Commission has somehow proposed to modify the spurious emission limits, which was never intended. The Commission therefore finds that it would be less confusing to maintain the existing spurious emission rule with the limit expressed in power density units, rather than EIRP, and it will make no changes to § 15.255(c)(3).

18. With respect to BridgeWave's request for an increase in spurious emission limit, the Commission notes that it is not making any changes to the spurious emission limit. Thus, it finds that the concerns expressed by BridgeWave about increased filtering requirements are not warranted, and likewise there is no reason for us to consider increasing the spurious emission limits as BridgeWave suggests.

19. With regard to the radio astronomy service and National Radio Astronomy Observatory (NRAO) concerns, the Commission observed at the outset that, although the NPRM proposed to increase the average EIRP power limit, it proposed to limit peak emission levels, and also "to retain the existing limits on spurious emissions and peak transmitter output power." The Commission's intention here was to seek comment on a proposal to maintain the appropriate power limit itself (i.e., in the case of spurious emissions, the existing 90 pW/cm² limit), not on whether to extend that limit to additional frequency bands or to limit the frequency range of operations for 60 GHz devices. Thus, the Commission does not believe it is appropriate to take either of these actions here. In any event, however, the Commission notes that because it has not increased the spurious emission limit or reduced the frequency range of measurements (presently 200 GHz) for

60 GHz devices, there is no higher risk of interference from spurious emissions than that which is presently allowed. Moreover, spurious and harmonic emissions typically roll off (i.e., reduce in amplitude) the further they are in frequency from the fundamental emission. Thus, harmonic emissions at the fourth harmonic – produced by the fundamental frequencies at 56.5-57.88 GHz and arising in the RAS band at 226-231.5 GHz - would be expected to be significantly lower than those already deemed to be acceptable at the third harmonic of these fundamental frequencies which are constrained by the present measurement cutoff. Similarly, spurious emissions generated by these devices at the 226-231.5 GHz frequencies in the RAS band would not be expected to be greater than those below 200 GHz (the top of the specified range). Further, while there is considerable difference in the atmospheric attenuation between 60 GHz and 231.5 GHz as claimed by NRAO, the difference in atmospheric attenuation between 200 GHz and 231.5 GHz is not significant and thus would not affect our conclusion. In fact, nearly all of the RAS allocations for which NRAO expresses concern were made before the implementation of unlicensed devices in §15.255 of our rules, and unlicensed 60 GHz devices have been successfully sharing spectrum with RAS without causing harmful interference. Further, NRAO provides no information or specific analysis of potential harmful interference from 60 GHz devices to radio astronomy service.

20. Consistent with this experience, the Commission finds that interference to Radio Astronomy Service (RAS) stations is unlikely. First, RAS receivers discriminate against off-axis signals. Second, such receivers are typically located in rural areas, not the urban areas where outdoor point-to-point 60 GHz devices are likely to be found.

Third, the severe propagation losses of RF signals in the 60 GHz band due to oxygen absorption and atmospheric conditions, and the highly focused and directional emissions of 60 GHz devices limit any potential for interference from fundamental emissions to RAS such that the Commission does not believe that sharing of this service with 60 GHz devices at higher EIRP levels is a cause for concern. It also does not find that the effect of harmonic and other spurious emissions from 60 GHz devices warrants an extension of the upper frequency band placed on spurious emissions of 60 GHz devices, because as we discussed, the difference in atmospheric attenuation between 200 GHz and 231.5 GHz is not significant enough to affect the acceptable level of emissions from both spurious and harmonic emissions ensured by operation of our existing rules. In addition, as noted, the Commission finds that NRAO's request to exclude part 15 operations from the entire 57-58 GHz band is outside of the scope of this proceeding. As for NRAO's request for a geographical separation zone around specific RAS sites, the Commission notes that in permitting the 57-64 GHz band to be used for unlicensed operations, it has already taken into account the 182-185 GHz RAS band, when it adopted the present spurious emission limit, and the Commission is keeping this limit the same, even though it allows higher fundamental emission limits, thereby providing the same protection to RAS frequencies as if the fundamental levels are unchanged from existing rules. The Commission therefore denies NRAO's request.

Transmitter ID

21. Section 15.255(i) of the rules requires that 60 GHz unlicensed emissions that emanate inside a building include a transmitter ID in order to permit users experiencing interference from indoor wireless local area network (LAN) devices to more accurately

identify the source of the interference; this transmitter ID must indicate the manufacturer and type of each unit of equipment. This requirement does not apply to devices with transmitting antennas located outdoors. In the NPRM, the Commission proposed to eliminate the transmitter ID requirement for any indoor devices whose emissions are directed outdoors, e.g., through a window. The Commission stated that any interference potential likely will be localized around a window link, and it is more likely that any 60 GHz emissions that are reflected from the glass in a window link will be attenuated by the walls and other surrounding objects and will not impact operations in adjacent areas. The Commission also sought comment on whether the transmitter ID requirement should be eliminated for all 60 GHz systems, as the proximity of indoor co-located equipment should allow the user to identify the interfering transmitter to other indoor devices without having to use this feature.

22. The Commission is modifying the rules to eliminate the transmitter ID requirement for all 60 GHz devices. Cisco has urged the Commission to consider the work of multiple standards bodies in its deliberations. The Commission observes that since the release of the NPRM, industry standards have been adopted for indoor 60 GHz WPAN devices which provide more efficient and cost-effective interference avoidance techniques, such as channelization, carrier sense multiple access with collision avoidance (CSMA/CA), beacon frames, etc. These techniques are similar to those implemented by wireless networking products operating in the crowded region of 2.4 GHz or 5.8 GHz frequencies where WPAN devices must co-exist with other WPAN devices as well. The Commission finds that, with these technological advances, co-existence between these 60 GHz devices is better resolved by voluntary standards than by a transmitter identification

requirement. Except for Cisco's concern (which also reflects questions about higher power indoor devices that the Commission has declined to permit), the record in this proceeding provides no support for retaining this requirement. The Commission's decision to limit higher power EIRP transmitters to outdoor applications and the factors in our assessment of the interference potential from window links above should alleviate Cisco's and the WPAN industry's concerns, while elimination of the transmitter ID requirement for all 60 GHz devices will lower costs for all 60 GHz devices, including WPAN devices. The Commission therefore finds that it is unnecessary to maintain a requirement that can add costs to equipment design and installation without any demonstrated countervailing benefit. Accordingly, the Commission amended its rules to eliminate the transmitter ID requirements for all 60 GHz devices.

Final Regulatory Flexibility Analysis

23. As required by the Regulatory Flexibility Act (RFA),¹ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the Notice of Proposed Rulemaking (NPRM) in ET Docket No. 07-113.² The Commission sought written public comment on the proposals in the NPRM, including comment on the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.

A. Need for, and Objectives of, the Report and Order.

24. The Report and Order amends the regulations for outdoor 60 GHz radio frequency devices that do not require a license to permit an increase in the allowable

¹ See 5 U.S.C. 603. The RFA, see 5 U.S.C. 60-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Public Law No. 104-121, Title II, 110 Stat. 857 (1996), and the Small Business Jobs Act of 2010, Public Law No. 111-240, 124 Stat. 2504 (2010).

² See In the Matter of Revision of the Commission's Rules Regarding Operation in the 57-64 GHz Band, ET Docket 07-113, Notice of Proposed Rulemaking (NPRM), 22 FCC Rcd 10505 (2007).

emitted signal level for systems using very high gain directional antennas; to allow the emissions from all 60 GHz systems to be measured as an equivalent isotropically radiated power (EIRP); and to eliminate the need for all 60 GHz systems to emit a transmitter ID signal. The new rules for higher emission limits will promote longer communication ranges for unlicensed outdoor point-to-point 60 GHz broadband digital systems and thereby extend the ability of such systems to supply very high speed broadband service to office buildings and other commercial facilities, promoting broader deployment of point-to-point digital systems in this band. These longer range systems also could have significant benefits for economic development and job growth by providing additional competition in the broadband market and lowering cost for broadband access to small business owners, enabling the operation of communications systems in support of 4th generation (4G) wireless and furthering the Commission's objectives to bring broadband access to every American. In addition, amending the rules to permit the emission limit for any 60 GHz device to be specified as an EIRP conducted power level would promote repeatability of measurement data, facilitating compliance measurements and saving costs for entities making products that must comply with our rules. Further, eliminating the requirement for transmitter identification (transmitter ID) for all 60 GHz equipment would enable the development of lower cost indoor systems in this band. The rule changes in this Report and Order therefore will provide needed flexibility and cost savings for unlicensed devices to support broadband service in the 60 GHz band.

B. Statement of Significant Issues Raised by Public Comments in Response to the IRFA.

25. There were no public comments filed that specifically addressed the rules and policies proposed in the IRFA.

C. Response to Comments by the Chief Counsel for Advocacy of the Small Business Administration.

26. Pursuant to the Small Business Jobs Act of 2010, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration, and to provide a detailed statement of any change made to the proposed rules as a result of those comments. The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

D. Description and Estimate of the Number of Small Entities to Which the Rules Will Apply.

27. The RFA directs agencies to provide a description of, and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.³ The RFA defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small business concern” under Section 3 of the Small Business Act.⁴ Under the Small Business Act, a “small business concern” is one that: (1) is independently owned and operated; (2) is not dominant in its

³ See 5 U.S.C. 603(b)(3).

⁴ *Id.* 601(3).

field of operations; and (3) meets any additional criteria established by the Small Business Administration (SBA).⁵

28. Small Businesses, Small Organizations, and Small Governmental Jurisdictions. Our action may, over time, affect small entities that are not easily categorized at present. We therefore describe here, at the outset, three comprehensive, statutory small entity size standards that encompass entities that could be directly affected by the proposals under consideration.⁶ As of 2009, small businesses represented 99.9% of the 27.5 million businesses in the United States, according to the SBA.⁷ Additionally, a “small organization” is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”⁸ Nationwide, as of 2007, there were approximately 1,621,315 small organizations.⁹ Finally, the term “small governmental jurisdiction” is defined generally as “governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”¹⁰ Census Bureau data for 2007 indicate that there were 89,527 governmental jurisdictions in the United States.¹¹ We estimate that, of this total, as many as

⁵ Id. 632.

⁶ See 5 U.S.C. 601(3)–(6).

⁷ See SBA, Office of Advocacy, “Frequently Asked Questions,” available at <http://web.sba.gov/faqs/faqindex.cfm?areaID=24> (last visited Aug. 31, 2012).

⁸ 5 U.S.C. 601(4).

⁹ INDEPENDENT SECTOR, THE NEW NONPROFIT ALMANAC & DESK REFERENCE (2010).

¹⁰ 5 U.S.C. 601(5).

¹¹ U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES: 2011, Table 427 (2007).

88,761 entities may qualify as “small governmental jurisdictions.”¹² Thus, we estimate that most governmental jurisdictions are small.

29. The adopted rules pertain to manufacturers of unlicensed communications devices. The appropriate small business size standard is that which the SBA has established for radio and television broadcasting and wireless communications equipment manufacturing. The Census Bureau defines this category as follows: “This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.”¹³ The SBA has developed a small business size standard for firms in this category, which is: all such firms having 750 or fewer employees.¹⁴ According to Census Bureau data for 2007, there were a total of 939 establishments in this category that operated for part or all of the entire year. Of this

¹² The 2007 U.S Census data for small governmental organizations are not presented based on the size of the population in each such organization. There were 89,476 local governmental organizations in 2007. If we assume that county, municipal, township, and school district organizations are more likely than larger governmental organizations to have populations of 50,000 or less, the total of these organizations is 52,095. If we make the same population assumption about special districts, specifically that they are likely to have a population of 50,000 or less, and also assume that special districts are different from county, municipal, township, and school districts, in 2007 there were 37,381 such special districts. Therefore, there are a total of 89,476 local government organizations. As a basis of estimating how many of these 89,476 local government organizations were small, in 2011, we note that there were a total of 715 cities and towns (incorporated places and minor civil divisions) with populations over 50,000. CITY AND TOWNS TOTALS: VINTAGE 2011 – U.S. Census Bureau, [available at http://www.census.gov/popest/data/cities/totals/2011/index.html](http://www.census.gov/popest/data/cities/totals/2011/index.html). If we subtract the 715 cities and towns that meet or exceed the 50,000 population threshold, we conclude that approximately 88,761 are small. U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES 2011, Tables 427, 426 (Data cited therein are from 2007).

¹³ U.S. Census Bureau, 2007 NAICS Definitions, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing”; <http://www.census.gov/naics/2007/def/ND334220.HTM#N334220>.

¹⁴ 13 CFR 121.201, NAICS code 334220.

total, 784 had less than 500 employees and 155 had more than 100 employees.¹⁵ Thus, under this size standard, the majority of firms can be considered small.

E. Description of Projected Reporting, Record keeping and Other Compliance Requirements.

30. The Report and Order contains a non-substantial modification to the information collection requirements. The rules adopted in this Report and Order will apply to small businesses that choose to use, manufacture, design, import, or sell part 15 60 GHz devices. There is no requirement, however, for any entity to use, market, or produce these types of products. Small businesses are already subject to the existing rules with regard to reporting, record keeping and other compliance requirements related to 60 GHz devices. The rules adopted in this Report and Order do not add substantial additional compliance burden on small businesses.

F. Steps taken to Minimize Significant Economic Impact on Small Entities and Significant Alternatives Considered.

31. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than

¹⁵ http://factfinder.census.gov/servlet/IBQTable?_bm=y&-fds_name=EC0700A1&-geo_id=&-_skip=300&-ds_name=EC0731SG2&-_lang=en.

design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.¹⁶

32. In this Report and Order, we modify our rules for outdoor 60 GHz radio frequency devices that do not require a license to permit an increase in the allowable emitted signal level for systems using very high gain directional antennas; to allow the emissions from all 60 GHz systems to be measured as an equivalent isotropically radiated power (EIRP); and to eliminate the need for all 60 GHz systems to emit a transmitter ID signal. The new rules for higher emission limits will promote longer communication ranges for unlicensed point-to-point 60 GHz broadband digital systems and thereby extend the ability of such systems to supply very high speed broadband service to office buildings and other commercial facilities, promoting broader deployment of point-to-point digital systems in this band. These longer range devices and services could also have significant benefits for economic development and for consumers and businesses by providing additional competition in the broadband market, lowering costs of broadband access to small businesses without increasing the potential for harmful interference. In addition, amending the rules to permit the emission limit for any 60 GHz device to be specified as an EIRP conducted power level would promote repeatability of measurement data, facilitating compliance measurements and saving costs for large and small entities making products that must comply with our rules. Further, the elimination of the transmitter identification requirement would lower cost and benefit small businesses and consumers of all 60 GHz devices, thereby promoting cost savings without imposing additional regulatory burden.

¹⁶ 5 U.S.C. 603(c).

G. Report to Congress.

33. The Commission will send a copy of the Report and Order, including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act.¹⁷ In addition, the Commission will send a copy of the Report and Order, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the Report and Order and FRFA (or summaries thereof) will also be published in the Federal Register.¹⁸

Ordering Clauses

34. Pursuant to the authority contained in Sections 4(i), 301, 302, 303(e) and 303(f) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 301, 302a, 303(e) and 303(f), this Report and Order is hereby ADOPTED and part 15 of the Commission's rules ARE AMENDED as set forth in the final rules, effective **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

CONGRESSIONAL REVIEW ACT

35. The Commission will send a copy of this Report and Order in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, see 5 U.S.C. 801(a)(1)(A).

36. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Report and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

¹⁷ See 5 U.S.C. 801(a)(1)(A).

¹⁸ See 5 U.S.C. 604(b).

Report to Congress

37. The Commission will send a copy of the Report and Order, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.¹⁹ In addition, the Commission will send a copy of the Report and Order, including this FRFA, to the Chief Counsel for Advocacy of the SBA.²⁰

List of Subjects in 47 CFR Parts 2 and 15

Communications equipment.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch,
Secretary.

¹⁹ See 5 U.S.C. 801(a)(1)(A).

²⁰ See 5 U.S.C. 604(b).

Final Rules

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR parts 2 and 15 to read as follows:

PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

1. The authority citation for part 2 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Section 2.1033 is amended by revising paragraph (b)(11) to read as follows:

§ 2.1033 Application for certification.

* * * * *

(b) * * *

(11) Applications for certification of transmitters operating within the 59.0-64.0 GHz band under part 15 of this chapter shall also be accompanied by an exhibit demonstrating compliance with the provisions of § 15.255 (g) of this chapter.

* * * * *

PART 15 - RADIO FREQUENCY DEVICES

3. The authority citation for part 15 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, 304, 307, 336, 544A and 549.

4. Section 15.204 is amended by revising the introductory text in paragraph (c) to read as follows:

§ 15.204 External radio frequency power amplifiers and antenna modifications.

* * * * *

(c) An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator. An intentional radiator may be authorized with multiple antenna types. Exceptions to the following provisions, if any, are noted in the rule section under which the transmitter operates, *e.g.*, §15.255(b)(1)(ii) of this part.

* * * * *

5. Section 15.255 is amended by revising paragraphs (b), (e), and (f) and removing paragraph (i) to read as follows:

§ 15.255 Operation within the band 57-64 GHz.

* * * * *

(b) Within the 57-64 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

(1) Products other than fixed field disturbance sensors shall comply with one of the following emission limits, as measured during the transmit interval:

(i) Except as indicated in paragraph (b)(1)(ii) of this section, the average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm.

(ii) For transmitters located outdoors, the average power of any emission shall not exceed 82 dBm minus 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm minus 2 dB for every dB that the antenna gain is less than 51 dBi. The provisions of § 15.204(c)(2) and (c)(4) of this part that permit the use of different antennas of the same type and of equal or less

directional gain do not apply to intentional radiator systems operating under this provision. In lieu thereof, intentional radiator systems shall be certified using the specific antenna(s) with which the system will be marketed and operated. Compliance testing shall be performed using the highest gain and the lowest gain antennas for which certification is sought and with the intentional radiator operated at its maximum available output power level. The responsible party, as defined in § 2.909 of this chapter, shall supply a list of acceptable antennas with the application for certification.

(2) For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm. In addition, the average power of any emission outside of the 61.0-61.5 GHz band, measured during the transmit interval, but still within the 57-64 GHz band, shall not exceed 10 dBm, and the peak power of any emission shall not exceed 13 dBm.

(3) For fixed field disturbance sensors other than those operating under the provisions of paragraph (b)(2) of this section, the peak transmitter conducted output power shall not exceed -10 dBm and the peak EIRP level shall not exceed 10 dBm.

(4) The peak power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-64 GHz band and has a video bandwidth of at least 10 MHz. The average emission levels shall be calculated based on the measured peak levels, over the actual time period during which transmission occurs. Measurement procedures that have been found to be acceptable to the Commission in accordance with §2.947 of this chapter may be used to demonstrate compliance.

* * * * *

(e) Except as specified paragraph (e)(1) of this section, the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (b) of this section.

(1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

(2) Peak transmitter conducted output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-64 GHz band and that has a video bandwidth of at least 10 MHz. Measurement procedures that have been found to be acceptable to the Commission in accordance with §2.947 of this chapter may be used to demonstrate compliance.

(3) For purposes of demonstrating compliance with this paragraph, corrections to the transmitter conducted output power may be made due to the antenna and circuit loss.

* * * * *

(f) Frequency stability. Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

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